AMPEX

BCC-20 Digicam

...the most advanced field production camera

Preliminary

BCC-20 Digicam: the portable field production camera with a computer in its head

The BCC-20 Digicam camera from Ampex Corporation. It's the product of years of dedicated and innovative research and development. The Digicam is a unique, exceptional and revolutionary camera developed and manufactured by Ampex in Cupertino, California.

The BCC-20 Digicam. It's going to mean many different things to different people in the worldwide television industries.

Introducing Many "Firsts"

To EFP experts, the BCC-20 Digicam offers many impressive firsts:

- the **first** portable camera with automatic setup capability
- the **first** EFP camera to offer studio picture quality from a self-contained portable with size, weight and convenience comparable to the best ENG cameras
- the **first** portable camera controlled by a microprocessor and memory in its head
- the **first** camera to offer Spatial Error Correction that achieves .05% (virtually perfect) registration in all three registration zones
- the **first** EFP camera offering a full remote setup capability
- the **first** camera of any type capable of using rugged fiber-optic RGB picture transmission with integral power transmission

Fully Upgradable

The Digicam is more than a camera. It's fully upgradable from ENG to EFP, and its picture quality allows its use for day-to-day studio needs. Start out with a simple, self-contained analog controlled camera, convert to a sophisticated system with microprocessor circuitry in the head and finally add automated setup. Expand as needs demand and budget allows.

The multi-faceted BCC-20. A great camera for ENG/EFP and studio requirements today . . . and any challenges the future might bring.

Features:

- Unsurpassed picture quality
- "Computer-in-head" control system
- Full automatic set-up capability
- Full remote set-up and control
- Fiberoptic picture transmission
- Perfect companion to the Ampex VPR-20 portable recorder
- Sized for maximum portability
- A whole family of cameras — from self-contained analog portables to digitally controlled cameras with remote control and automatic setup capabilities
- ⅔-inch Plumbicon* or Saticon** tubes

* TM N.V. Philips
** TM Hitachi

BCC-20 Digicam: it offers a dramatic breakthrough in video picture registration

One of the major advantages offered by the Digicam is its extraordinary ability to achieve 0.05% registration in all three zones of the TV picture and to dramatically reduce shading errors. In fact, the Digicam can produce better picture quality either manually or automatically than the most highly skilled technician can, using conventional setup procedures. This superior registration is accomplished through a new digitized approach we call Spatial Error Correction System (SECS).

Introducing SECS

SECS can easily overcome those picture quality problems that have plagued broadcasting for years. The SECS system's cursor allows the operator to get rid of such typical distortions as "bowing", "S" distortion and off-axis corner registration errors.

In the SECS approach, the total picture area is divided into 13 boxes horizontally, and 14 boxes vertically. Digital memory in the head stores correction coefficients for vertical and horizontal registration and shading errors for each box. Under manual control, the boxes are addressed using H. Position and V. Position knobs on the Master Set-up Panel (MSP).

This "cursor" mark can be quickly moved to the area of distortion and the correction coefficient incremented to correct the error. There are no complicated procedures, no error averaging. The SECS system gets the error corrected on-the-spot, wherever it is.

As an example, a linearity error is remedied by moving the cursor along the axis and correcting the distortion until the error is eliminated. (See (1))

A "Cursor" in your Corner

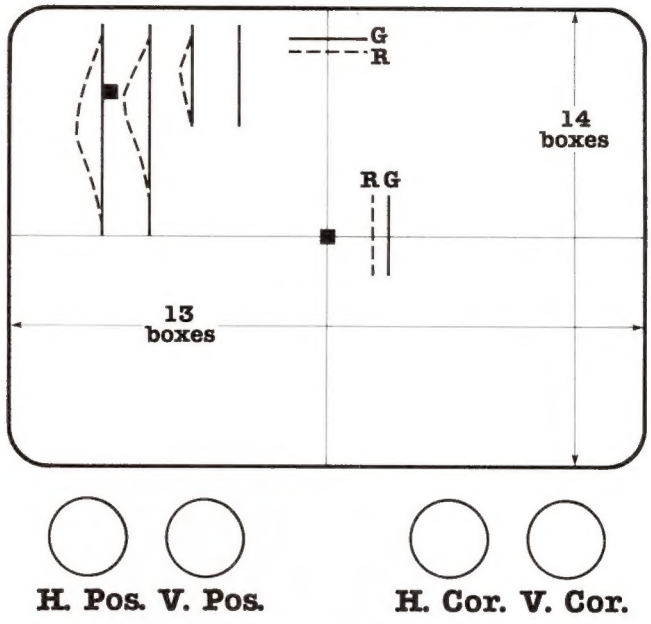
With the SECS cursor, the operator can bring registration in all three zones to 0.05% without delay. He can either move the mark manually or automatically to any of the screen's 182 boxes to bring the registration error to virtually zero.

When the cursor is used for off-axis errors, the correction in the cursor box is added in decreasing amounts towards the axis involved. (See (2))

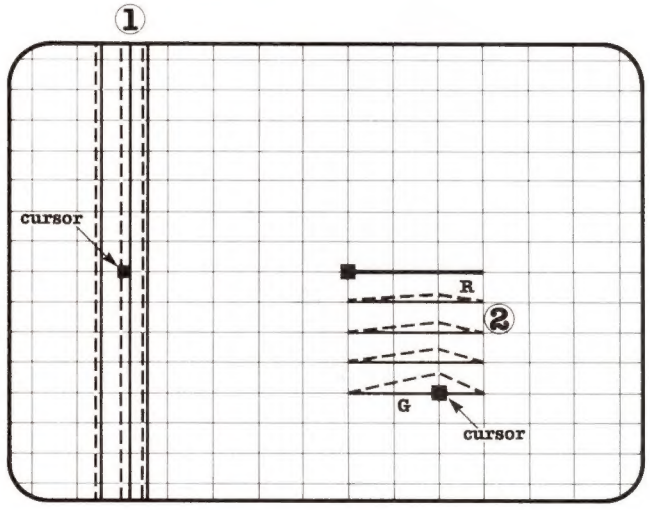
Comparable portable cameras today normally achieve 0.1% in Zone One, 0.2% in Zone Two and 0.5% in Zone Three. The best studio cameras are specified at 0.05%, 0.1% and 0.2% respectively. SECS is especially effective in getting good registration in the previously difficult off-axis regions. (See (2))

All the same cursor movements that improve registration are also available to accomplish superb shading corrections in the video as well.

Cursor System



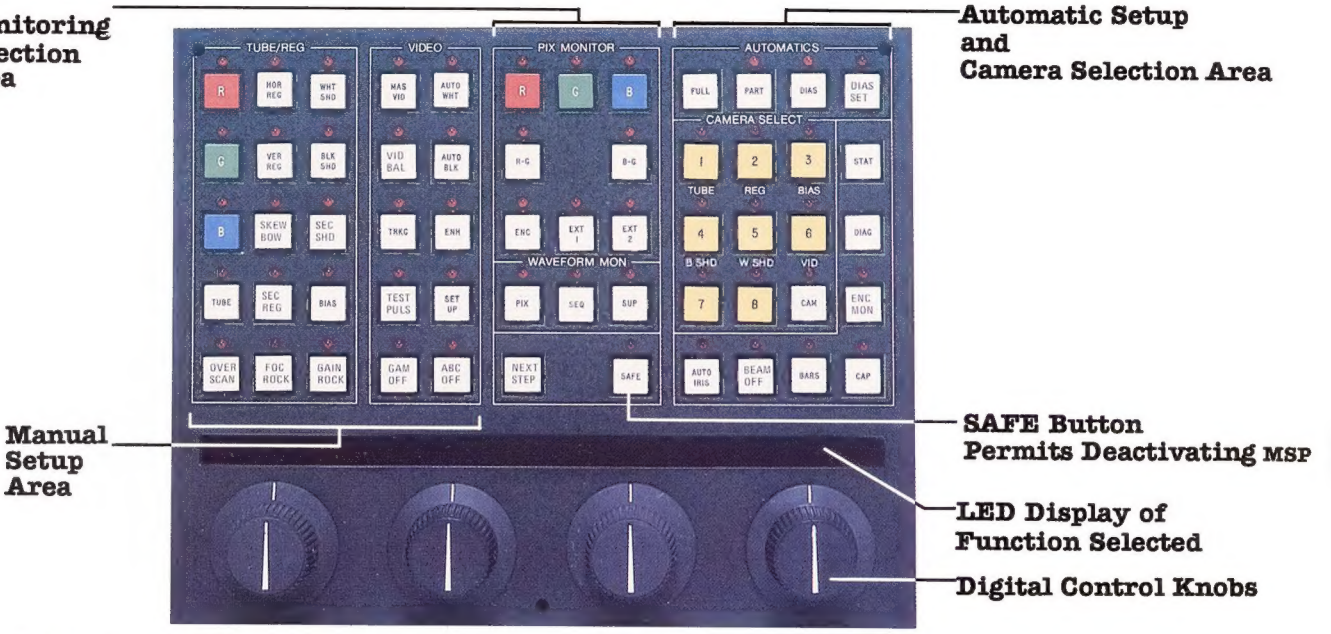
Configurations:



Cursor located off center axis.

1. **Response to applied horizontal shift.**
2. **Response to applied vertical shift.**

The BCC-20 Digicam Master Set-up Panel: it gets the job done manually or automatically and takes up a minimum of space



The Master Set-up Panel (MSP) is the main controller for the camera system. Its panel controls manual setup of a digital BCC-20, as well as automatic setup when an Automatic Setup Unit (ASU) is used. It can interface directly to the camera head, through a junction box or through the system's Base Station.

Use it manually...

The BCC-20 Digicam system can be controlled using the Master Setup Panel — both on location and in the studio.

Up to eight digital cameras can be fully or partially set up manually using the Master Setup Panel. Among the operations that can be adjusted are: 1) tube alignment, 2) black and white shading, 3) registration, 4) tracking, 5) black and white balance and 6) enhancement.

Function buttons select the desired parameters to be adjusted. The LED display legends over the four knobs change as the function buttons are depressed. Rotating the knobs sends upcount or downcount pulses to the memories in the camera head. The sequence button "leads" the operator through a standard setup sequence. This is both convenient and also ensures that all parameters are adjusted in optimum order. The operator can depart from and return to the sequence to suit his particular needs. Monitoring is switched to match the parameters being adjusted.

The MSP controls the Spatial Error Correction System, including the cursor system to correct distortions in any small zone, even in the corners.

The MSP also provides control of the Automatic Setup Unit. Both MSP and ASU can handle up to eight cameras with or without base stations, depending on the system configuration.

Or use it automatically...

You can fully or partially set up eight digital BCC-20 cameras using a single Automatic Setup Unit with the MSP in far less time and with better results than with a conventional camera.

The Digicam ASU is a sophisticated computer-based system that analyzes the video signal derived from a test chart or diascope in the lens and sends digital commands to the camera head micro-processor to correct the error. It does this in 182 zones on the picture to give unexcelled picture quality.

The ASU can be interfaced with either a self-contained camera head via a junction box or a base station camera via a connection to the base station. The ASU uses a special test pattern viewed through the lens or from the diascope.

The ASU also incorporates a "queuing" feature — cameras 1, 3 and 5 can be automatically set up at the same time, or a quick automatic touch up of registration or alignment can be made at the push of a button. It isn't necessary to wait for each camera to be set up before moving on to the next one.

With the Digicam, you can truly improve day-to-day performance. There is no compromise on picture quality to save production costs.

BCC-20 Digicam: an exciting camera from lens to interchangeable rear modules

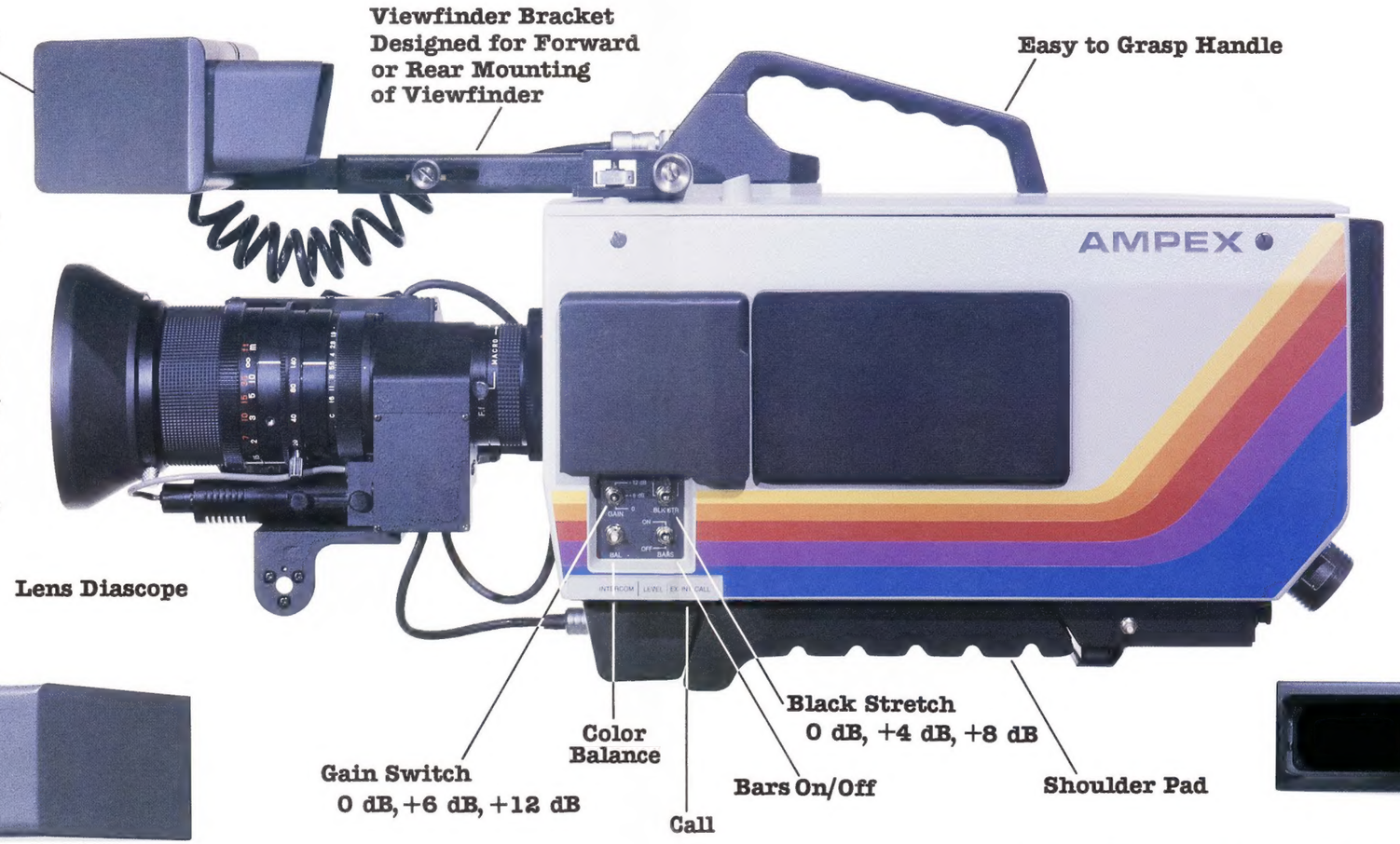
The BCC-20 camera is a truly unique and innovative camera system designed to meet the challenges of the '80s.

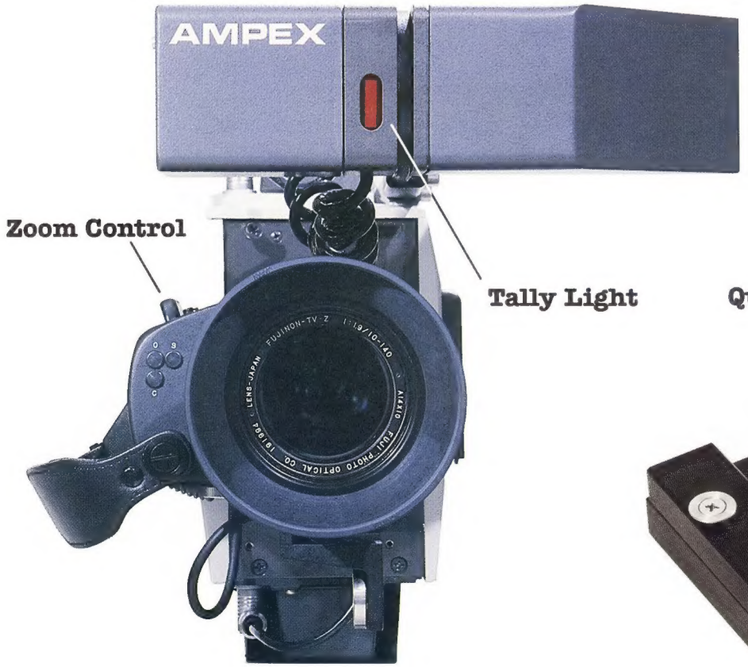
From lens to highly flexible, interchangeable rear modules, Digicam offers a wide array of standard operating features.

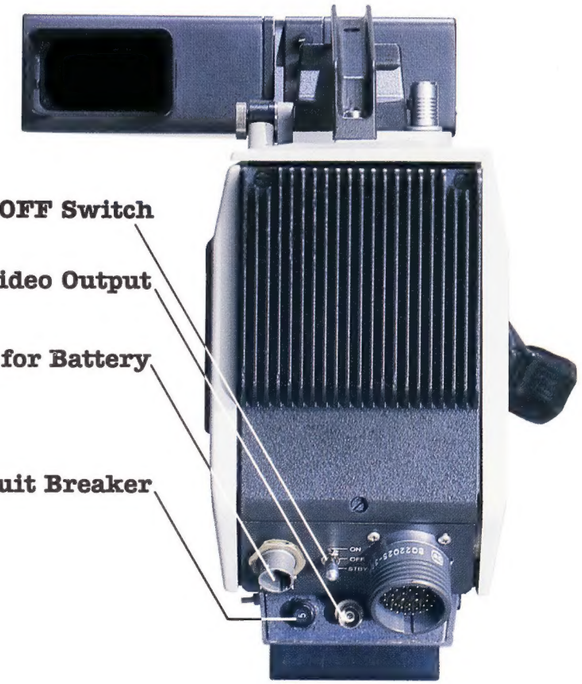
Small Size

The BCC-20 Digicam is designed to fit into small places. The MSP is only half-rack width, the Remote Control Panel quarter-rack width. The fiberoptic cable is ultra-lightweight and compact — a mile of cable weighs less than 250 lbs.

The "bottom line" is that the Digicam is superbly suited to mobile vans or portable applications where size and weight are critical yet performance cannot be sacrificed.







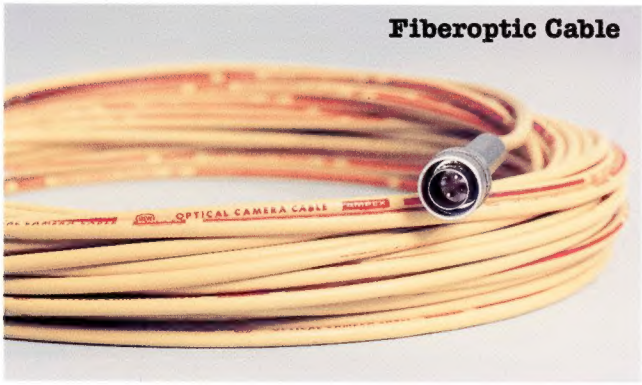
BCC-20 Digicam: more operating features for your money

With the BCC-20 Digicam, all the head electronics can be adjusted or controlled remotely. The basic camera head houses an integral optical system which includes: a BK-7 glass prism, ⅔-inch yokes and tubes, a bayonet-mounted lens with optional internal diascope, bias light, and dual four-position filter wheels.

A full range of video processing is accomplished at the BCC-20 head. Digicam offers local or remotely switched monitoring of individual R, G, B and R-G, and B-G outputs at standard levels. Color bars and saw test signals also are available in the head.

Digicam has an automatic exposure system, "auto iris", with a center ellipse window to relieve the operator from manually maintaining the correct exposure.

The camera also provides automatic black and white balance, superior highlight handling using automatic beam control, switched gain control of +6 or +12 dB for low light conditions, "black stretch" from 0 to +8 dB, external viewfinder connection for picture confidence viewing while recording on a portable VPR-20, and genlock from either black burst or composite color video.



Fiberoptic Cable

The BCC-20's Fiberoptics:

The BCC-20 Digicam offers transmission of RGB video, control, viewfinder video and power — all in a dual fiber/dual conductor, ultra-lightweight fiberoptic cable. The fiberoptic cable offers many distinct advantages to the user in the field never before possible.

The fiberoptic cable offers: a flat frequency response, no complex equalizing, no radio frequency interference, less weight (about 45 pounds per 1000 feet), a smaller (0.3 inches in diameter) cable that's more flexible and highly resistant to environmental conditions, and a hookup permitting use to over 2 kilometers with negligible signal degradation. The BCC-20 Digicam fiberoptic system also features a special weather-resistant connector that's fully field repairable in most emergency situations.

Rear Module

Interchangeable Rear Modules:

The BCC-20 Digicam has been designed with both single and multi-camera flexibility in mind. Three interchangeable system and power modules may be easily installed in the rear of the camera. When used as a self-contained analog camera, the BCC-20 employs a 12V DC-DC Encoder Module. For cable use while hooked up to a base station, the Digicam uses either the 180V DC-DC RGB Multicore Rear Module or the 180V DC-DC RGB Fiberoptic Rear Module.

Big Performance — Small Tubes:

The BCC-20 Digicam uses ⅔-inch diode gun Plumbicon, Saticon or standard lead-oxide type camera tubes. With its unique video processing and digital registration, this camera system provides large tube performance with its smaller ⅔-inch tubes.

Aperture Corrector/Two-Line Enhancer:

The Digicam's unique RGB aperture correction at the camera head provides maximum resolution. The camera's detail processing electronics and very special coring selectively discriminate against noise to give startling detail in all three channels. This results in low light details with outstanding clarity. The system's built-in two-line contour enhancer in both horizontal and vertical channels sharpens and crispens picture, without the annoying edge effects commonly seen.

Diascope Compensator

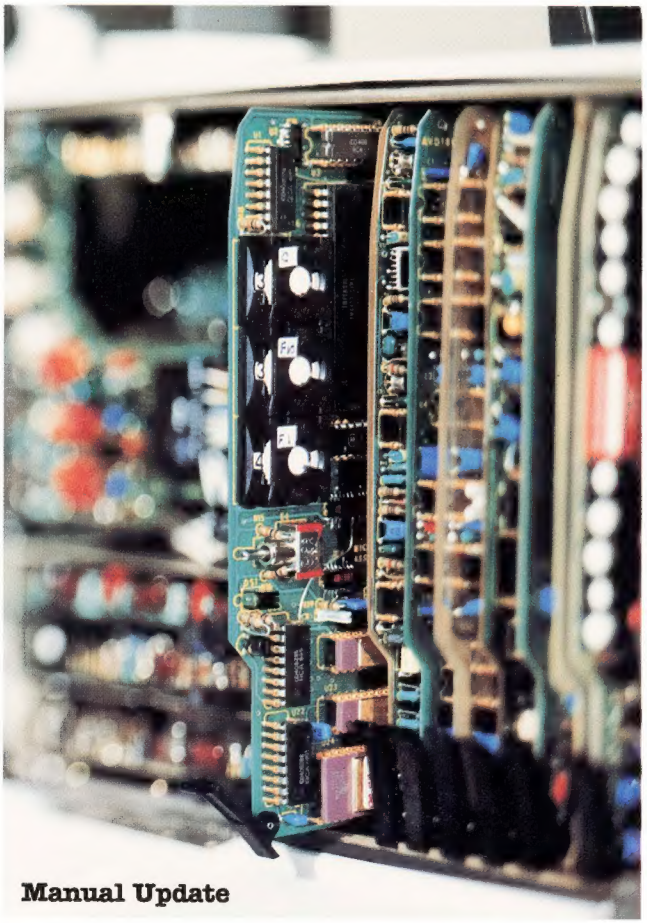
The Diascope Compensator (routine in the ASU) compares the video response from the diascope to that from the lens test pattern and stores the different signals. Thereafter, automatic setups using the diascope are compensated for diascope "through lens" differences.

Quick-Release Tripod Mount:

The BCC-20 features a fast-release tripod mount accessory. This improves the mobility of the camera during both field and studio production activities.

Prismatic Beamsplitter:

The BCC-20 Digicam uses a high-quality BK-7 glass prism beamsplitter offering better colorimetry, less ghosting and better shading than high index refractive prisms of an equivalent speed.



Manual Update

Manual Memory Update:

A unique convenience feature available with the BCC-20 digital camera. When the need arises for camera adjustments in the field without a Master Setup Panel, the operator may use thumbwheel selector switches and an increment/decrement switch inside the digital camera head to make any adjustments that can be made with the MSP.

Dual Filter Wheels:

The BCC-20 Digicam includes dual concentric four-position filter wheels for color temperature compensation and scene illumination correction. The dual filter wheels can compensate quickly for any indoor/outdoor light differences. Besides the normal filters, the Digicam also includes a built-in "star" filter.

Monitoring Flexibility

The BCC-20 Digicam offers monitoring at the camera head while shooting and recording with an Ampex portable VPR-20 recorder. In this way, the operator knows exactly what he's getting at all times and can work with supreme confidence. Two view finders — either a 1½-inch (monocular) or 3-inch monitor — are available to suit the preferences of the cameraman.

Both viewfinders have monitor switching for registration and camera alignment purposes. When the camera is used on the shoulder, the 3 inch viewfinder is mounted forward of the operator for easy viewing. When the camera is on a tripod, the 3 inch viewfinder swings back for rear-of-the-camera viewing. Viewfinder controls include: brightness, contrast and peaking. Resolution is better than 400 TV lines.

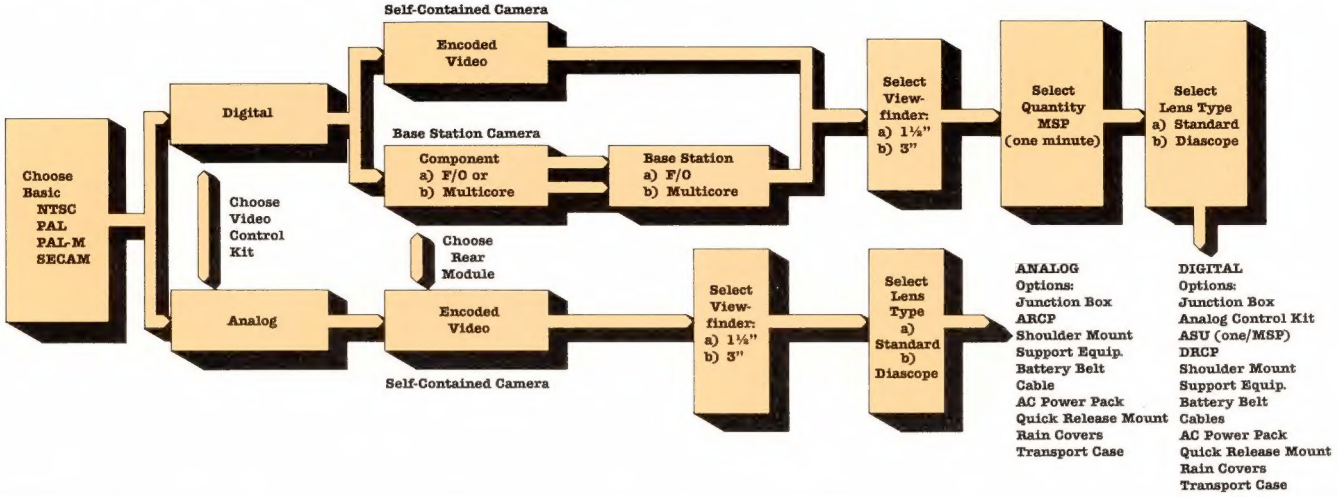
Two-Channel Interphone/Effects Microphone

The system includes a two-channel interphone and effects mike. The effects mike delivers excellent audio pickup in any field situation. This mike also offers a reliable response across the full audio range.

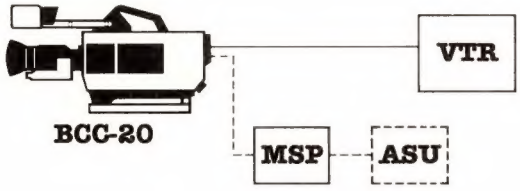
Based on the popular Z80

The BCC-20's digital electronics capabilities are built around the popular Z80 microprocessors. The Z80 was selected for the BCC-20 head and ASU because it offered the capacity required, worldwide availability and acceptance, and a wealth of developed and proven software.

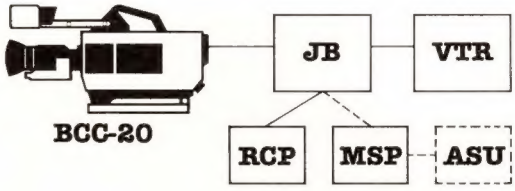
BCC-20 Configuration Guide



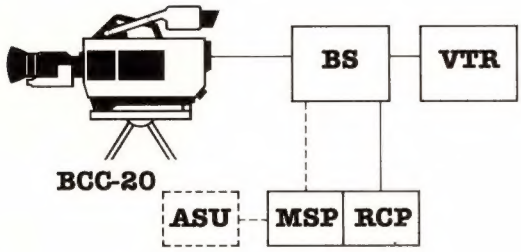
Self Contained – Direct



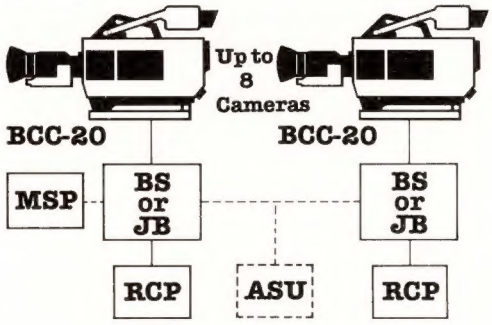
Self Contained with Remote Control



Base Station

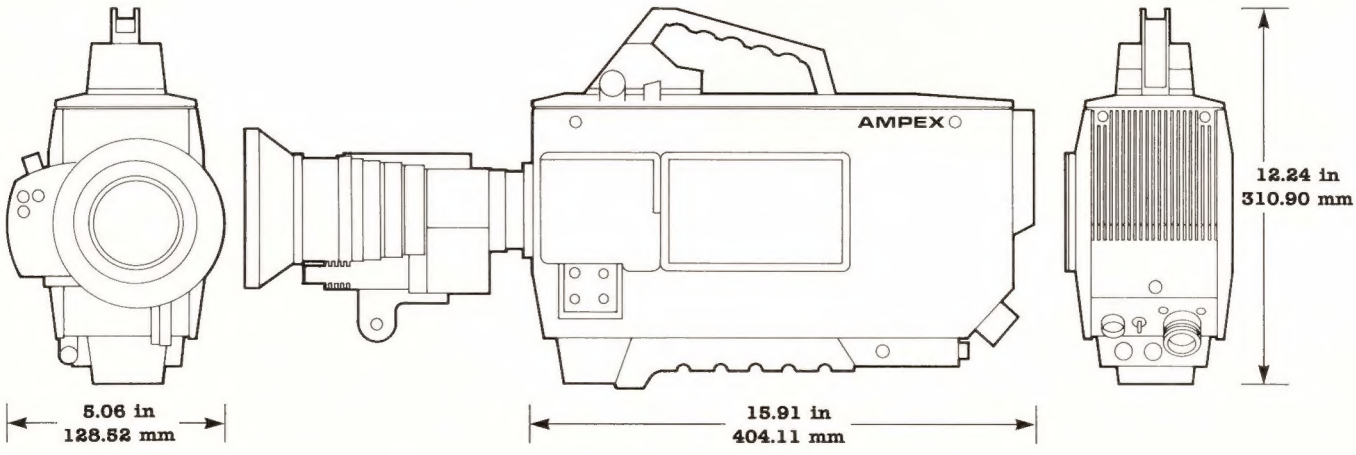


Multicamera



Code:

MSP – Master Set-Up Panel
DRCP – Digital Remote Control Panel
ARCP – Analog Remote Control Panel
F/O – Fiber Optics
ASU – Automatic Set-Up Unit
JB –Junction Box
RCP – Remote Control Box
BS – Base Station



BCC-20 Camera System Preliminary Specifications

Camera Tubes

Rear Loading

⅔" lead oxide (standard or diode gun) or Saticon

Optics

f1.4 prism with bias light

Dual series filter wheel:

Filter 1	Filter 2
clear	clear
cap	0.6ND
4700°K	1.0ND
6400°K	star

Lens Provision

Bayonet mount

Power provided for zoom, iris, diascope lamp

Signal-to-Noise

NTSC/PAL-M 53 dB, PAL/SECAM 51 dB

(Gamma and all corrections off, 200na. in green)

Sensitivity

200 foot candles at f4

(with 200 na. in green, 60% reflective)

Low light usable picture to 6 f.c.

Registration	**Analog Camera**	**Digital Camera**
Zone 1	0.1%	0.05%
Zone 2	0.2%	0.05%
Zone 3	0.4%	0.05%
Geometry		
Zone 1	0.5%	0.1%
Zone 2	1.0%	0.1%
Zone 3	1.5%	0.1%

Shading*	**Analog Camera**	**Digital Camera**
White – absolute	2%	1%
– differential	1%	1%
Black – absolute	1%	0.5%
– differential	1%	0.5%

*Over center 90% picture

Highlight Handling

3 channel Automatic Beam Control

Resolution/Depth Modulation

Diode Gun/Plumbicon

>50% @ 400 TVL

Standard head Oxide/Saticons

>40% @ 400 TVL

Limiting horizontal resolution at center 700 TVL

Systems

NTSC/PAL/PAL-M/SECAM

Detail Processing

- Independent RGB horizontal aperture correction
- Vertical and horizontal contours from green
- Switchable mixed highs processing
- Advanced noise reduction circuits

Remote Control	**Analog Camera**	**Digital Camera**
• Functions controllable	22	130

- Digital camera has full remote set-up capability

Controls (external)

- Balance (white and black)
- VTR start/stop
- Standby Power
- Gain 0-6-12 dB
- Bars on/off
- Audio Gain
- Viewfinder int/ext.
- Audio Call
- Viewfinder brightness
  peaking
  contrast
- Black Stretch 0-4-8 dB

Outputs

Video

- Self-contained:
  Encoded Video
  Video Monitoring
- Base Station:
  RGB-multicore or fiber-optics

Audio

- Effects and intercom

Inputs

- Genlock (encoded video)
- Return viewfinder
- Program and intercom audio
- Power
- Remote Control Data

Size

See outline drawings

Weight

15 to 18 lbs (depending on configuration)

Power

- 36 watts operating
- 6 watts standby
- Self-contained: 10.5 to 17V for battery operation
- Base station: 180V

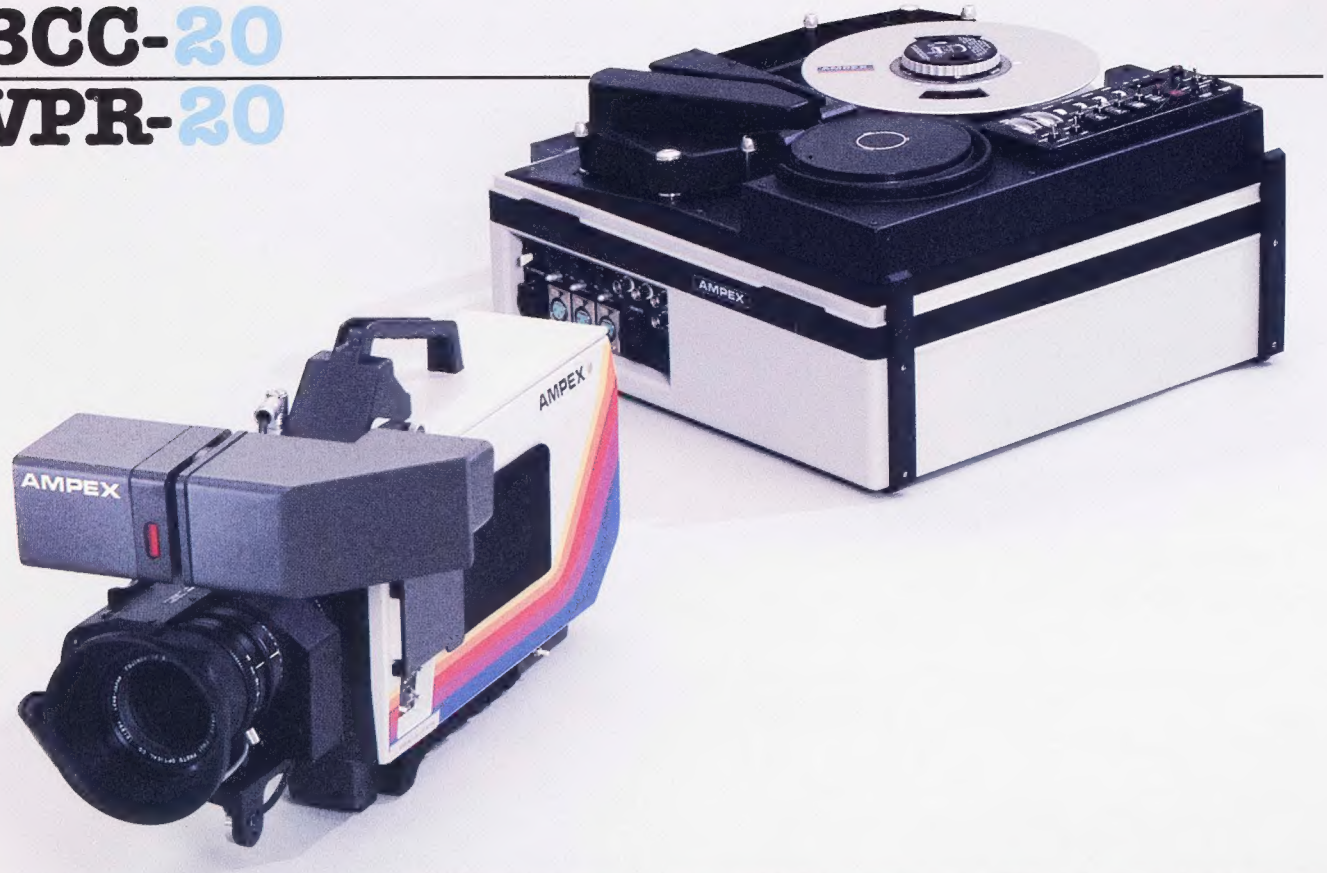
Temperature

Operating: −20°C to +50*C

Stable over ±10°C range

Operating: +20°C to +50°C

BCC-20
VPR-20



The team of the BCC-20 and the VPR-20 gives you 20/20 vision, the best possible camera/recorder combination. Historically, the Ampex VPR-20 portable recorder is the result of two and a half decades of pioneering innovation in the world of professional broadcasting. Ampex recorders have established themselves as the premiere VTRs in the industry.

When the BCC-20 Digicam works with the portable VPR-20, there's never any doubt about the quality of the videotaped material recorded. Ultimate record confidence is attained using a scanner-mounted video playback head. The viewfinder can be used to monitor this confidence playback to check that all portions of the camera and recording system are 100% functional. The Digicam viewfinder displays information pertaining to the status of the picture, operation of the VTR and how much tape is remaining.

The BCC-20 camera and VPR-20 were designed to work together. The START-STOP controls on the camera start or stop the VPR-20. The VPR-20 tells the BCC-20 camera's "tape remaining" indicator how much tape is left.

Ampex Supports its Products

Ampex professional video products are used in over 100 nations around the world and reach into nearly every sector of human endeavor — entertainment, education, government, medicine, industry and science. Today, as in the beginning, Ampex is dedicated to serving all of its many customers with experienced and responsive worldwide sales and service support. The people of Ampex are always ready to provide training, documentation and maintenance.

For more information, contact your Ampex sales representative.

AMPEX

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